

# **CSS OPERATIONS IN SUPPORT OF FORCE XXI DIVISION REDESIGN - A BRIDGE TO THE FUTURE OR BEFORE ITS TIME?**

**A MONOGRAPH  
BY  
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CSS Operations in Support of Force XXI Division Redesign-A Bridge to the Future or Before Its Time? By Major Steven W. Pate, USA, 60 Pages.

This paper analyzes the combat service support concept for the redesigned Force XXI Division to determine if the concept improves the efficiency and effectiveness of support to the maneuver battalions and division as a whole. The paper begins with a analysis of the proposed support concept as it differs with current structure and procedures. The author critiques the support concept's ability to satisfy current logistics doctrine from FM 100-5. The concept is then analyzed against the goals and objectives for the future found in TRADOC Pam 525-200-6. Following the doctrinal and future expectations for combat service support the concept's technological initiatives are evaluated to determine dependency on technology enablers. Finally, the paper discusses the last major reorganization of the U.S. Army from the Army Of Excellence Study to determine lessons learned that can support the current Force XXI reorganization.

This paper will argue that the reorganization of the DISCOM will support the current divisional force structure and the future Force XXI structure. The DISCOM restructuring makes a great deal of sense given adequate manpower levels. Personnel saving will result over time with the incremental application of successful technology enhancements and procedures.

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## TABLE OF CONTENTS

Introduction .....	1
CSS Concept for the Force XXI Division .....	6
Doctrinal Analysis .....	14
Technology Enablers .....	27
AOE Lessons Learned .....	41
Conclusions .....	54
Notes.....	57
Bibliography .....	61

## Introduction

As the US Army approaches the 21st century in a post cold war environment it is developing new doctrine, tactics, techniques, procedures, technologies and organizations to meet the needs of tomorrow's force. These new materials and methods effect all facets of the future army and will require intensive testing and careful assessment prior to eventual adoption and implementation. Force XXI is the term coined by army leadership to shape the development of the 21st century army. The purpose of this monograph is to analyze the proposed concept of Combat Service Support (CSS) operations in support of Force XXI Division redesign. The monograph will determine; if the concept in theory doctrinally improves CSS effectiveness now and in the future and is feasible for implementation into today's divisional force structure. The overall concept will be examined with an emphasis on the support impact to the ground maneuver battalion and with an analysis of lessons learned from the reorganization following the Army of Excellence (AOE) study of Division 86.

A campaign plan for Force XXI was developed to synchronize developmental efforts and improve the chances of success for the design of the 21st century force. This three tiered plan first focuses on the redesign of Army operational forces; secondly, reinvents the Institutional Army, and finally develops and acquires information-age technologies.<sup>1</sup> The objective of Force XXI is to be a more resource-efficient Army, with enhanced capabilities through information age technologies.<sup>2</sup> To accomplish this goal the Force XXI campaign plan projects a three phased timeline. Phase one is centered on

the development of digitized maneuver battalions and brigades using an Experimental Brigade taskforce (EXFOR) for testing. Phase two is on the design of the division, and Phase three is the integration of information-age technology into the corps and entire Army. Force XXI can best be thought of as a "rolling end state" along a developmental continuum that ultimately results in a series of successively refined future brigades, divisions and corps.<sup>3</sup> The concept of Force XXI arose from an analysis of a Revolution in Military Affairs (RMA) following the cold war and emergence of the information age. Commensurate with the RMA is a corresponding Revolution in Military Logistics to support the changing nature of war now and in the future.<sup>4</sup>

On 24 January 1996 the CSA approved the Force XXI division redesign concept along with the reorganization of the Division Support Command (DISCOM)<sup>5</sup>. The redesign concept of the DISCOM incorporates some support procedures modified to achieve improved efficiency, effectiveness, and reduce the overall support personnel structure, commonly referred to as "tail", in the division. The US Army Combined Arms Service Support Command (CASCOM) supported the development of the concept for *CSS Operations in Support of Force XXI Division Redesign*. This support concept significantly changes support methods and capabilities for divisional ground maneuver battalions. The CSS concept has designed some innovative organizational changes, to include a forward support company (FSC) that consolidates the support capabilities of the maneuver battalion HHC with the habitual support element from the supporting forward support battalion (FSB); as well as a division support battalion (DSB) that combines the main support battalion (MSB) and aviation support battalion (ASB). On

paper these changes follow a logical wire diagram that does consolidate some redundant functions, but requires further explanation to ensure support to the maneuver battalion.

A benefit of this concept is a streamlined logistics system in the division along with some material support personnel savings. Personnel reductions result from eliminating "redundant" support personnel in the division force structure. This concept is therefore worthy of careful analysis, testing, and validation to determine if it can support the current and future division in war.

While organizational structure and administrative procedures can reduce manpower requirements, these methods are not a remedy for reducing all personnel overhead. In contrast, an efficient organizational structure can promote an improved level of specialization and effectiveness that is more capable of adapting to changes in technology and techniques. The manpower required to provide support to a maneuver battalion will depend heavily on the needs of that unit, based on its personnel and equipment density, and operational employment. Redundancy of functions are easy to identify in a echelon system, but often the volume and differences of functions performed are overlooked or ignored. For example, maintenance performed on a vehicle, radio, or weapon has a finite set of requirements regardless of the number of echelons it is divided into. The number of maintenance functions segregated into multiple levels such as operator, organizational, direct support, and general support or aggregated into one or two levels are the same. The tasks performed at different levels are often dissimilar and therefore in reality are not redundant. To identify a function as redundant it must be

assessed as excess to a system based on the essential tasks that must be performed within a system or upon a piece of material to achieve a given endstate or capability.

Technology enables changes in the way functions are performed. However, technology advancements do not always live up to their expected benefits. For example food service personnel were leveraged under AOE with T-Rations and MREs in the US Army Field Feeding Program. Later, the army discovered during protracted campaigns such as Desert Shield and Desert Storm that this leveraged approach to food service was an unacceptable method to feed US soldiers. To fix this problem food service personnel and equipment had to re-fielded negating some of the initial savings of the program. These kinds of mistakes are expensive and time consuming to recover from and could have an adverse effect on the future conduct of war.

As mentioned, this monograph will endeavor to answer the question of: does the CSS operations in support of Force XXI division redesign doctrinally improve CSS effectiveness now and in the future and is it feasible for implementation into today's divisional force structure? To answer this question the first section will cover a doctrinal analysis of current logistics characteristics and future developmental guidance. Then the paper will assess to what degree this support concept is dependent upon technology enablers and determine if the support reorganization can be supported with current technology tools given some flexibility with manpower? Finally, what lessons can be learned from the last major reorganization from the Army of Excellence (AOE) study that should be avoided with Force XXI? The concentration of this monograph is on the organizational structure and not on the specific numbers of personnel required to support

each function. As the CSA General Dennis J. Reimer says: "Balance is the key word" to arriving at a viable Force XXI solution<sup>6</sup>. Often a bold new initiative is required to drive change by providing a new model of how to look at the old problem of war. In this case it is the support of a future division, as directed by the leadership of the US Army and the Department of Defense, through Force XXI initiatives.

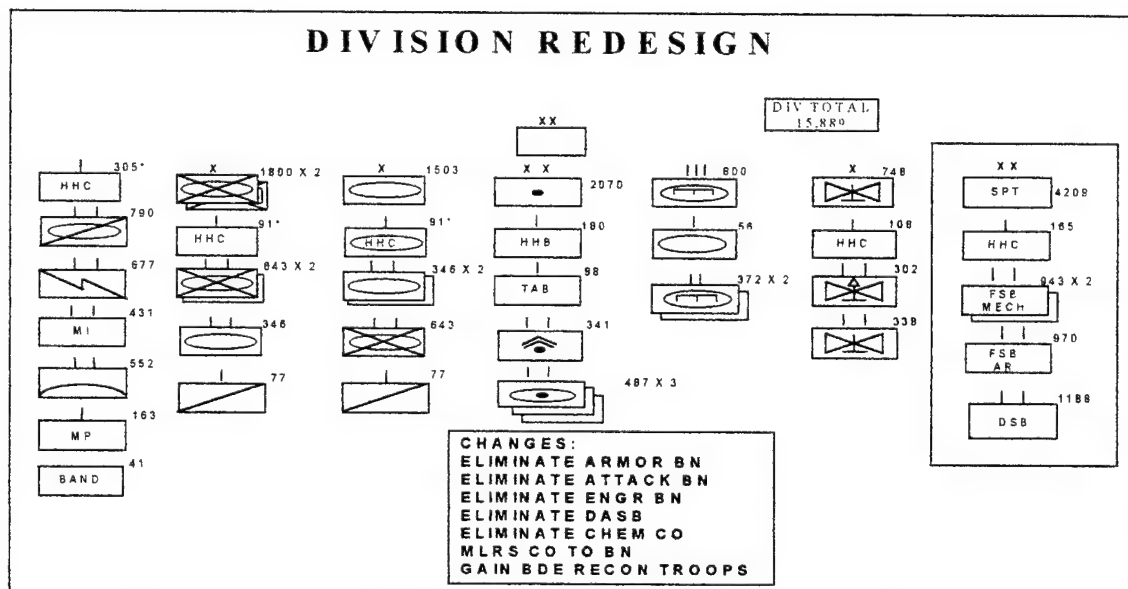
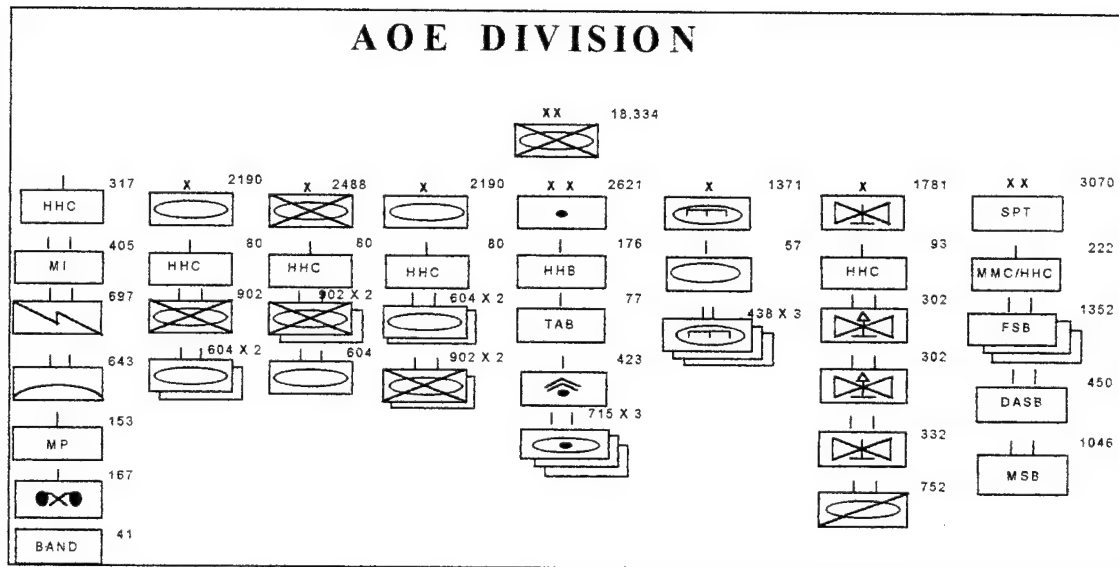


## CSS Concept for the Force XXI Division

The concept for support for the Force XXI division redesign reorganizes support units and functions from the maneuver battalion to the division support command (DISCOM). The primary emphasis of this monograph is to analyze the impact of this concept on the maneuver battalion with regard to current and future doctrine, technology, and reorganizations lessons learned. However, logistical systems are indelibly integrated to higher levels and therefore the support concept for the entire division will be outlined to provide a background for this analysis.

The DISCOM is redesigned from the Army Of Excellence structure with a main support battalion and a division aviation support battalion consolidated into a single division support battalion. The forward support battalion (FSB) remains intact and receives a forward support company (FSC) for each maneuver battalion it supports. The FSB reorganizes internally to provide a base support company (BSC) that consolidates supply and maintenance functions in support of the FSCs and the brigade support area (BSA). The size of the FSB expands greatly with the addition of the FSCs. Personnel are realigned from internal consolidation of the supply and maintenance companies and the support platoons of the maneuver battalions. The overall logistics personnel force structure in the division is expected to decrease to meet the redesigned division personnel numbers. Though the DISCOM increases in number of personnel and companies assigned, the organizational support capabilities within maneuver units are removed reducing the overall number of personnel in support of a division. Given the AOE divisional force structure and the approved Force XXI division force structure for

reference (see below); the support plan and manpower needs for Force XXI will require validation and testing<sup>7</sup>. The FSC and its relationship to the maneuver battalion and the FSB will be the primary focus of the analysis to determine the impact of combat service support to the maneuver battalion and the division.



The goal of the forward support company is to provide a multifunctional, modular unit capable of providing support as close to the point of need as possible.<sup>8</sup> This concept supports an initiative to develop a new and improved Battlefield Distribution System by consolidating supply and support “stove pipe” support systems into a centralized location and system. To improve the velocity of supply and support distribution, the logistics units of the division were reorganized to centralize the management functions of arm, fix, fuel, move, and sustain for soldiers and units in a division. To achieve improvements in efficiency and effectiveness, the FSC was developed to consolidate the organizational and direct support functions that are organic to the headquarters and headquarters company (HHC) of a maneuver battalion, and the support provided by the forward support battalion. Additionally under this concept, the MSB and DASB are reorganized into a division support battalion (DSB) to consolidate functions such as organizational ground maintenance and Class IX ground Prescribed Load List stockages.<sup>9</sup> The by-product of this concept is a reduced manpower support structure, heavily leveraged with technologically advanced communications systems designed into an integrated combat service support system (ICS<sup>3</sup>).<sup>10</sup> This concept is based on the theory that asserts that with a reduction of redundancy, consolidation of management, improved distribution velocity enabled with information technology, CSS managers will be able to anticipate rather than react to requirements. Such an ability would reduce forward stockages in the logistics pipeline, as well as personnel manpower requirements.

The forward support company is a multifunctional unit that is comprised of a supply and transport platoon, a medical platoon, and a maintenance platoon. It is

organized to support a specific type maneuver battalion. The FSC is a mobile unit capable of keeping pace with its assigned maneuver battalion and will provide the supported battalion all classes of supply, tactical field maintenance (direct support(DS)/organizational), and Level I medical support.<sup>11</sup> Additionally, due to the multi-functionality of the FSC's logistics support, an operations cell is organic to the company's headquarters section. The mission of this cell is to coordinate direct support activities of the company and provide a centralized conduit to the forward support battalion and higher support systems. Concentration of all combat service support (CSS) activities in one organization attempts to achieve an effective separation of functions to produce an economy of effort and supply on the battlefield. This allows the maneuver battalion commander the opportunity to focus on the combat mission.<sup>12</sup> This concept relocates the functions currently found in the maneuver battalion's HHC into the forward support company (FSC).

The FSC supply and transport platoon provides the maneuver battalion Class I, II, III, IV, V, VII, IX sustainment support using a supply section, a distribution section, and food service section. The supply section provides class II, III(p), IV, VII and IX. Note: one Class IX team will support each maneuver company and maintains the company's PLL/combat spares. The Distribution section provides the class III(b), and V for the maneuver battalion. The food service section will provide its own food service and for the maneuver battalion as well.<sup>13</sup>

The FSC maintenance platoon provides organizational and direct support maintenance, and equipment recovery for the maneuver battalion. In garrison the FSC

provides the maneuver battalion all TAMMS, PLL, and motor pool support functions. Property accountability, and financial management procedures such as budgeting are not outlined in the concept and must be addressed. The forward support battalion's base support company will provide back-up DS maintenance support to the FSC and supported maneuver battalion.<sup>14</sup>

The FSC medical platoon provides Level 1 medical support, including company and platoon medics, and the evacuation of casualties for the assigned maneuver battalion. The medical platoon is very similar to the medical platoon currently assigned to the maneuver battalion HHC. The medical evacuation procedures from the battalion aid station utilizing assets from the forward support battalion's medical company and higher echelon support will remain unchanged.

In addition to the development of the forward support company, the forward support battalion (FSB), and division support battalion (DSB) of the division support command (DISCOM) are all designed to improve the efficiency and effectiveness of CSS to the Force XXI Division. The FSB, along with one FSC for each maneuver battalion, has a base company and a medical company. Additionally, the consolidated support functions in the DSB consist of an area maintenance company, quartermaster company, transportation motor transport company, medical company, and an aviation intermediate maintenance (AVIM) company.<sup>15</sup> A brief explanation of each highlights the key differences and improvements to the current division support system.

The FSB base support company (BSC) has the primary mission of providing supplies and services to attached units in the brigade support area (BSA) and the brigade headquarters. It also provides limited back-up support to the FSCs. The base support company consists of a supply and transport platoon, automotive maintenance platoon and a headquarters section. The supply and transport platoon serves as the single source of supply and transportation (less class VIII) for the brigade. In addition to class I, II, IIIp, IV, VI, and IX supply and transportation, the BSC provides a water point for the BSA, ammunition transfer capability, and bulk Class III. The automotive maintenance platoon supports with area direct support maintenance the FSB(-), brigade headquarters, brigade reconnaissance troop, and units operating in the BSA. This is not unlike how the automotive maintenance company (-) presently supports the BSA under the AOE force structure. The headquarters section provides food service to the BSA and support operations command and control (C<sup>2</sup>) for the FSB.

The division support battalion combines the similar supply and maintenance activities of the MSB and DASB to produce a single unit that decreases the overall force structure of the DISCOM by more than 300 soldiers. The DSB serves divisional troops not attached to forward brigades as well as reinforces class III(B) supply to the FSBs and to units located in the DSA. The DSB consists of a headquarters, transportation motor transport company (TMT), area maintenance company (AMC), quartermaster company, medical company, and an aviation intermediate maintenance company (AVIM).

The TMT Company of the DSB provides transportation support, to include tactical and operational relocation, evacuation, lateral distribution and area distribution,

to the division.<sup>16</sup> The area maintenance company provides common DS ground maintenance to division troops and CSS elements operating in the division rear area to include organizational maintenance to the HHC DISCOM and AVIM Company.<sup>17</sup> The quartermaster company provides supply support to division troops and CSS elements in the division rear area.<sup>18</sup> The medical company provides Level 1 and 2 support, to include medical supply, treatment teams and evacuation, for elements within the division rear area.<sup>19</sup> Finally the AVIM will provide aviation intermediate maintenance to the aviation brigade to include class IX aviation authorized stockage list (ASL), repairable exchange (RX), quick supply store (QSS). Note: The Aviation Brigade receives Class III (B) and Class IX ground supply support from the quartermaster company.<sup>20</sup>

The CSS reorganization in support of the force XXI Division Redesign eliminates functional organizational redundancies and leverages technology to reduce the number of personnel assigned to support a division. Under this theory, considering that the personnel numbers are not final, the support personnel currently assigned to the maneuver battalion HHC would be combined with current FSB personnel to man the FSC. This results in a net increase of a company element for each maneuver battalion and conversely an overall decrease in the number of organizational and direct support personnel in support of a maneuver battalion. Under this concept, combining the MSB and DASB produces a reduction of force structure in excess of 300 soldiers.<sup>21</sup>

On paper, this concept presents a bold initiative that warrants close evaluation and scrutiny. The CSS reorganization for the Force XXI division does consolidate a number of functions and reduces some redundancy. The innovation of the FSC, creates

another multifunctional modular designed support unit, that supports current logistics doctrine and future developmental guidance. This study starts by analyzing the CSS concept against current doctrinal logistics characteristics in FM 100-5 and future doctrinal guidance found in TRADOC PAM 525-200-6 Combat Service Support. Then the CSS concept will be examined against the importance, strengths, weaknesses and vulnerabilities of information technology enablers such as: Total Asset Visibility (TAV), In-Transit Visibility (ITV), Battlefield Distribution (BD), and Integrated Combat Service Support Systems (ICS<sup>3</sup>). To gain the ultimate ability to anticipate logistics, requires technology enablers such as appliqué systems. These capabilities also increase the velocity of supply and decrease the size of the logistics inventory pipeline, personnel requirements, and time. However, these technologies appear to enhance the capabilities of support personnel and units and therefore are best utilized in this reorganized support structure. Finally the analysis will examine the U.S. Army's restructuring during the Army Of Excellence (AOE) to identify applicable lessons learned that will assist in current reorganization initiatives completion, testing and implementation. From this analysis the author will make conclusions about the feasibility and suitability of the support concept now and in the future



## Doctrinal Analysis

Historically, doctrinal changes frequently produce major organizational changes.<sup>22</sup> Changes in support organizations are no exception. However, these organizational changes tend to evolve from the current structure using the means available and the perceived best methods to fight the wars of the day. An alteration in a unit's support organization can be as small as the addition or deletion of unit supply clerk, or as large as the development of a forward support battalion. The purpose for these transformations is to improve support and/or address new requirements resulting from doctrinal changes in other parts of the army organizational force structure (i.e., combat arms, and combat support units). These organizational and doctrinal modifications have a major impact on the way an army fights and ultimately its ability to win on the battlefield. Doctrine is defined and explained as follows in Leavenworth Paper No. 16 on *"Deciding What Has to be Done: General William E. DePuy and the 1976 Edition of FM 100-5, Operations."*

Doctrine is defined as "authoritative fundamental principles by which military forces guide their actions." Doctrine is an approved, shared idea about the conduct of warfare that undergirds an army's planning, organization, training, leadership style, tactics, weapons, and equipment. These activities in preparation for future war lie at the heart of the military profession in modern societies. When well-conceived and clearly articulated, doctrine can instill confidence throughout an army. An army's doctrine, therefore, can have the most profound effect on its performance in war.<sup>23</sup>

Support or logistics capabilities are an integral part of any organization, whether it is a Fortune 500 corporation or an army; a "Mom & Pop" business or a tribal warlord

band. The increased complexity of war, enhanced by the increasing numbers of different weapons systems, and enlarged battle space has magnified the support burden. Though often viewed as a separate function best isolated, segregated, and consolidated behind the front line of troops support remains inseparable from the units and soldiers it is designed to sustain. The primary focus of support is always to the soldiers. This is a doctrinal focus that has not and will not change in Force XXI or the army after next, even though the nature of war and way the US Army fights may.<sup>24</sup> With this focus in mind and an understanding of what doctrine is; the concept of CSS operations in support of the Force XXI division redesign will be analyzed using current logistics doctrine found in chapter 12 of FM 100-5. Then the concept will be analyzed with guidance for future combat service support development found in TRADOC Pam 525-200-6. The primary question that must be answered is; does doctrinally the reorganized support structure of the division improve combat service support? Logistics doctrinal characteristics demonstrate how the CSS concept of consolidating organizational and direct support functions in the FSB with the formation of a forward support company and the consolidation of supply and maintenance functions in the base support company with the division support battalion improves the ability to anticipate, integrate, respond, improvise and ensure continuity of support. Additionally, formulation of these multifunctional units designed to support individual maneuver battalions proves sound and supports the overall plan to develop modular units capable of being tailored into a unique task force organization as required by METT-T.

The forward support company is an innovative design for reorganization of the DISCOM in support of Force XXI division redesign. The vision of future war is: "The Force XXI battlefield will be characterized by force projection of smaller, more lethal forces; rapid maneuver for decisive operations; non-linear environment; and maximum utilization of technology."<sup>25</sup> Additionally, the realities of resource constraints and prudence of economy require the optimization of resource utilization. A common way to analyze effective resource utilization is to categorize functions such as direct and indirect fire weapons systems and maneuver forces as "tooth" and support functions, infrastructure, and personnel as "tail" and then compare the ratio of the two. This approach is so prevalent that it is one of twelve primary areas of concern that the military Chiefs of Staff must brief to Congress during the quadrennial review. Information technology and digitization are expected to enhance digital logistical awareness and forecasting capabilities allowing CSS leaders at all levels to provide the foresight and responsiveness necessary to maintain the division's operational tempo. Digital enhancements are expected to increase effectiveness without an unwanted increase in personnel. This support concept will decrease the logistics footprint on the battlefield and the number of personnel required to man support functions.<sup>26</sup> Though the vision of the future Force XXI battlefield calls for a smaller, more lethal force the current focus of the redesigned division is primarily on maintaining the same sized maneuver battalion currently fielded with a reduced support tail, leveraged to provide enhanced logistics support. This is an ambitious goal and is currently under testing at Fort Hood, Texas. A full field test at NTC is scheduled for the Spring of 1997.

Most organizational changes tend to be evolutionary. As General Donn A. Starry said about the development of Division 86 the army is never a "finished product" each iteration is "not a be all, end all."<sup>27</sup> The same is true of Force XXI and the reorganization concept in support of the Force XXI division redesigned. Prior to the development of multifunctional logistics support battalions into forward and main support battalions at the division level, direct support to the maneuver battalion was provided by a forward area support team (FAST). The FAST was the command and control node for external support to the maneuver battalion. Support personnel attached from functional support battalions in the DISCOM manned the FAST. This system was proven to provide inadequate command and control (C<sup>2</sup>) and inefficient support to maneuver battalions. This was due to adhoc organizational flaws and the inability to build a cohesive support structure synchronized with other division support assets. Additionally noted during field operations, the staff of the functional support battalions were under utilized. To improve the shortfalls of the FAST system the forward support battalion was developed and was implemented during the reorganization of the US Army following Division 86 and the Army of Excellence. Reorganization of the functional support battalions in the DISCOM provided manning for the FSB and MSB. During this reorganization a support operations section was added to the support battalion staff. This allowed for close centralized planning with the supported maneuver brigade. This system allowed for a more consistent habitual support relationship prior to, during and following major training events and war.

Currently maneuver battalions provide organizational level logistics support utilizing support personnel assigned to each line company and the headquarters and headquarters company (HHC). The FSB provides on a habitual basis a support element, a maintenance support team (MST), consisting of between 21 and 37 personnel for a heavy maneuver battalion. The MST collocates with HHC maintenance section at the unit maintenance collection point (UMCP).<sup>28</sup> The FSB additionally collocates ambulances at the maneuver battalion aid station to evacuate casualties to the brigade support area, medical company in the FSB or higher echelon.<sup>29</sup>

The development of the Forward Support Company is mainly the combination of the organizational support capabilities assigned to the HHC with the support slice assigned to the FSB. This combination consolidates organizational and direct support maintenance into one unit but does not totally eliminate organization, supply or maintenance requirements. Unit supply functions to include arms rooms functions and some ULLS requirements remain unchanged. The FSB commands and controls the forward support company. The maneuver battalion has little to no capability for any of its internal support requirements beyond the responsibility of planning, forecasting and coordinating with the FSC and the support operations section of the FSB. Support planning is therefore consolidated at the battalion headquarters level and executed remotely by each FSC in direct support to a habitually supported maneuver battalion.

Current doctrine from chapter 12 FM 100-5 states that the characteristics of logistics are; anticipation, integration, continuity, responsiveness, and improvisation. Analyzing the CSS operations in support of the Force XXI division redesign with the

doctrinal logistics characteristics will demonstrate its ability to support current doctrine. For example: consolidation of planning, preparation, and direction for execution of support functions can increase the “span of communications” to improve continuity and responsiveness to the supported unit.<sup>30</sup> However, separating functions critical to a maneuver battalion success can adversely affect its internal responsiveness and integration as well as its ability to improvise its own support.

“Anticipation” is the identification, accumulation and maintaining of assets and information necessary to support operations at the right time and place.<sup>31</sup> Development of the FSC with a support operations section provides a designated focal point for all logistics support for the maneuver battalion. The support operations section is a technical resource to assist the maneuver battalion’s staff accurately plan and coordinate logistics support. This relationship creates a formal and informal transfer of information to the FSC that combined with trained logistics personnel and the means to support will enhance the anticipation of support requirements. However, the availability of logistics personnel organic to the maneuver battalion to assist in anticipating forecasting, or providing logistical requirements is now greatly reduced. This concept requires close coordination and a reliance on the capabilities of the FSC to ensure all requirements are forecast, planned and availability at the right place and time.

“Integration” is the synchronization of support during plans and preparation that ensures success during execution. Integration is normally achieved through assigning a mission to and coordinating with the best element capable of providing support, and identifying the feasibility or limitations of logistics for a concept of operation.<sup>32</sup> In this

case the FSC forms a unique consolidated support and coordinating node for the planning and execution of operations with the maneuver battalion. Additionally the FSC serves as a direct line to additional support capabilities organic to the FSB and DISCOM. By default the FSC is the only element that can provide organizational level support to Arm, Fix, Fuel, and Sustain soldiers in the maneuver battalion due to the elimination of redundant support capabilities. Thus the FSC is the best and only integrator to ensure “integration” in the support plan. The FSC achieves additional integration through its modular design creating a level of standardization and interoperability within heavy US Army maneuver units. This capability and design is also a characteristic desired of logistics units for the army after next.

“Continuity” is the uninterrupted supply and service support to sustain combat fighting power strength and agility. To ensure continuity doctrine states that logistics efforts never become hostage to a single source or mode of support.<sup>33</sup> At the battalion level it is obvious to conclude that consolidation of support into a single node such as the FSC can have a negative impact on the continuity of support in the maneuver battalion. However, with this support concept the FSC can receive back-up support for the maneuver battalion from the multifunctional capabilities of the base support company in the FSB. Additionally, the FSC has the automated logistics capability to be an efficient “ship to address” for distribution on the modern battlefield. This distribution capability will allow for the effective distribution from the corps and division directly to the maneuver battalions area of operation, further improving continuity of support. Therefore, this concept relies heavily on the success of the FSC to provide continuous

logistics support; just as the FSC depends heavily on the collective security of operations in the battalion combat and field trains.

“Responsiveness” is the ability to react rapidly in crises. To accomplish responsiveness logistics commanders and staff must adapt units to requirements, often on short notice. Units will frequently be task-organized for force-projection requirements that will be difficult to forecast with complete accuracy.<sup>34</sup> The FSC provides the maneuver battalion an optimal responsive logistics support organization capable of being task-organized to increase or augment support capabilities to the maneuver battalion. The FSC has the logistics automation and C<sup>2</sup> to support limited split based operations from the FSB. It can easily task-organize logistics capabilities with-in the division as well as support some limited augmentation external to the division such as mortuary affairs support. The HHC of the maneuver battalion is focused on the operations of its combat elements, and support to the staff. Therefore, is not ideally suited to command and control attachment of additional CSS assets with-in the company. Designed to operate forward of the BSA the FSC retains the responsiveness found with combat and field trains today.

“Improvisation” is the talent to make, invent, arrange, or fabricate what is needed out of what is at hand. Logistics improvisations will often spell the difference between success and failure of combat operations.<sup>35</sup> As LTG (Ret.) Heiser stated many unforeseen logistics problems in war are solved by the improvisation of trained CSS soldiers.<sup>36</sup> Improvisation is a talent that is acquired through a thorough study of logistics systems capabilities and operations. Only with this knowledge can logisticians



effectively hope to improvise support when called upon. The FSC provides the maneuver battalion a trained cadre of logistical leaders knowledgeable in the logistics systems and capabilities at their disposal as well as access to a talent pool readily available and monitoring the activity of the maneuver battalion at the FSB.

Evaluating the CSS operations in support of Force XXI Division Redesign and the FSC concept with current logistics doctrinal characteristics in chapter 12 FM 100-5 reveals that all five characteristics appear to be improved or enhanced. Anticipation is increased with the addition of a company headquarters with a support operations cell forward in direct support of a single maneuver battalion. This creates a greater capability to predict the logistics requirements of the battalion by virtue of proximity alone not to mention the future applications of technology enablers. Integration is obtained through the consolidation of organizational and direct support functions into a single support structure. The FSC will create greater integration of the maneuver battalion's requirements into the support plan for the entire brigade and FSB through the single focused support mission of one FSC. Operationally, this concept should reduce confusion of battalion logistics support operations for the S-4 and company teams. Continuity is enhanced by the availability of an efficient "ship to address" in the battalion area for supply distribution allowing for greater flexibility in receipt of throughput support from division and corps. Back-up support currently available in the FSB is still available under this concept further enhancing continuous support. Responsiveness; is enhanced through the development of the FSC organization. The FSC provides an organizational structure capable of being logistically task organized with greater

effectiveness than the maneuver battalion HHC. No longer required are, adhoc attachment of support slices from the FSB to the maneuver battalion will no longer be required. Improvisation is better supported through the availability of a larger number of logistics officers and NCO in direct support and in back-up support to a single maneuver battalion that is trained on the capabilities of available logistics systems and equipment. It appears that this concept adheres to current doctrinal logistics characteristics. An analysis of this concept with the idealized framework for the accomplishment of combined arms support in the mid and long-term will determine the concepts ability to possible survive beyond Force XXI or support as an evolutionary step to the army after next support.<sup>37</sup>

TRADOC Pamphlet 525-200-6 Combat Service Support is a living document designed to provide conceptual guidance to development of logistics doctrine, leader development, organizations and material changes focused of soldiers (DTLOMS). The overview concept is:

Rapid force projection from Continental United States (CONUS), extended lines of communication, and potential forcible entry into logistically bare-based areas of operations require Army development of a logistics system that is versatile, deployable, and expansible.

..... the Army's historical mind-set of echeloned support and structured tooth-to- tail ratios has little place in light of the new strategic environment.

As a minimum, Army logisticians should consider the creation of a system in which the realities of force projection necessitate the weaving of the current strategic, operational and tactical levels of logistics into a seamless continuum.<sup>38</sup>

TRADOC Pam 525-200-6 encompasses the entire breath of logistics from the sustainment base to deployed forces as well as at the strategic, operationally and tactical levels. Of primary focus for this analysis is the conceptual goal of a seamless logistics system, the focus of tactical commanders, the impacts of technology, and the required capabilities of: deployability, sustainability, automated, modularity, and propositioning.

The concept seeks to make the logistics linkages from strategic-operational-tactical transparent to the user. Under the redesigned division support structure the support system planing, management and execution are all contained in the FSC, FSB and DSB and should therefore be transparent to the maneuver battalion end-user. The FSC is responsible for most organizational and all direct support for maneuver battalions. The supply and maintenance readiness issues that are primarily supply or higher echelon repair functions will be the responsibility of the FSC and FSB. The FSC and redesigned division support structure will allow the tactical commander to focus their attentions forward. This support concept will provide a logistics C<sup>2</sup> node at the FSC and FSB levels capable of assuming greater responsibilities and functions not normally found at the tactical level (i.e. personnel replacement, finance services, and postal).<sup>39</sup>

This support concept attempts to produce substantial personnel savings through the elimination of redundant functions and efficiencies produced by technology enablers such as appliques using digitization of the battlefield, Integrated Combat Service Support System (ICS<sup>3</sup>) that will support TAV and ITV to better manage and forecast logistics requirements eliminating the requirement to maintain large stockpiles of supplies in the logistics pipeline at the company, battalion, brigade and division level. This approach

should transform the current logistics system from a warehouse based to a transportation based supply system. Therefore, the intention is that logistics at the maneuver battalion and brigade level will be less manpower intensive. CSS operations in support of the Force XXI division redesign do eliminate several support personnel functions through organizational redesign. However, the elimination of a large number of support personnel from the application of technology enablers is less apparent given the divisional support requirement.

The number of and justification for personnel saved should receive to closest scrutiny. The Force XXI maneuver battalion has the same number and types of major weapons systems such as M1A1 Tanks and M2 Bradley Fighting Vehicles (BFV) as found in today's maneuver battalions. These weapons systems drive a large portion of the support requirements for fuel, ammunition, and maintenance. In this concept the maintenance function is one that is heavily leveraged with the hope of technology enablers. With current manpower ceilings and the desire to increase the tooth-to tail ratio by reduced logistics structure LTG (ret) Heiser cautions that the army is regressing to the conditions when he enlisted in 1942 where there was a shortage of trained logisticians. He also feels that in the future there will not be time to recruit and train enough logistics personnel and he warns against relying too heavily on technology.<sup>40</sup> Additionally, General (ret) Magruder states that it is at the beginning of war is where logistics personnel are most critical.<sup>41</sup>

The FSC and CSS organization in support of Force XXI Division Redesign meet all of the required capabilities within the scope of an organizational and direct support

capability. The FSC, FSB, DSB, and DISCOM are all modular styled units capable of being deployed anywhere in the world providing sustainable support, using state of the art automation and communications technology to obtain TAV, and to support split based operations. However, the current and proposed division support structure is not designed to be fully self sustaining without Corps support capabilities and an interface to the industrial support base.

CSS operations in support of Force XXI Division Redesign is a concept designed to meet the requirements of current doctrine in FM 100-5 chapter 12 as well as address the conceptual requirements of TRADOC Pamphlet 525-200-6 Combat Service Support. Military operations have rarely succeeded due to logistics but many have failed due to the lack of logistics.<sup>42</sup> It is the logistics tail that provides sustainable strength to combat power. The redesigned DISCOM to include the FSC regardless of personnel savings makes a great deal of sense from a doctrinal view point. This organizational structure appears to be in a good position to capitalize on logistics systems technology efficiencies, and provide greater agility to the maneuver battalion. The final number of personnel saved has not yet been established and is the subject of testing with the 4th ID at Fort Hood, Texas. There are great expectations for substantial personnel savings as a result of logistics technology enablers; these technology induced personnel savings should be realized prior to the elimination of positions. These hopes should be anchored in sound unbiased facts and not wishful or conditional thinking.

## Technology Enablers

Logistics technology enablers are those technologies designed to increase and/or improve logistics capabilities. Current logistics technology initiatives are designed to achieve the goal of the Army Strategic Logistics Plan (ASLP) to provide “a seamless logistics system capable of providing world-class logistics support for America’s Army in any scenario.”<sup>43</sup> In support of this plan a multitude of Force XXI logistics technology and technique initiatives are currently under development. The Force XXI development process follows three axes: institutional, joint venture, and Army digitization.<sup>44</sup> It may be helpful to view these three axis’s as oriented along the traditional levels of war of strategic, operational and tactical respectively. However, these initiatives are integrated in an attempt to achieve the ASLP goal of a seamless system from the industrial base to the fox hole. The focus of this portion of the analysis is to determine the dependency of *CSS Operations In Support of Force XXI Division Redesign* concept on the presence and success of enabling technologies.

The proposed support concept for Force XXI is based on the techniques of centralized management, a consolidated single support system, and the use of modular decentralized multi-functional execution units. As Jacques Ellul states in his book *The Technological Society* technique is not merely technology; it is the domination of social, political, and economic life by the adopted goals of logic and efficiency.”<sup>45</sup> Therefore, even though technology for Force XXI logistics is extremely important, it may not be a

limiting factor in the innovation of organizational redesign, and streamlined or improved techniques.

This analysis begins with an explanation of some currently fielded logistics systems. Then the analysis examines the impacts of the following Force XXI logistics information technology initiatives: the Total Distribution Program (TDP) and Battlefield Distribution (BD), Integrated Combat Service Support Systems (ICS<sup>3</sup>), and appliqué. There are other information technologies, such as Digitized Technical Manuals (DTM). The DTM use off the shelf technology to provide CD-ROM based access to maintenance manual data using personal computers. Though CD-ROM data distribution has proven itself an economic way to distribute printed data it does not materially change the way support is provided. In addition to information technologies there are materiel oriented Force XXI logistics initiatives such as the new family of Medium and Light Tactical Vehicles (FMTV/LMTV), Contact Maintenance Truck (CMT), Forward Repair Vehicle-Heavy (FRS-H), and the Contact Test Set (CTS). All of these show evolutionary improvements to current systems but do not materially affect the reorganized division support concept. The information based technologies of TDP/BD, ICS<sup>3</sup>, and appliqué appear to be the major initiatives that will affect the methods of providing logistics support, and therefore will be analyzed. The six logistics functions of Man, Arm, Fix, Fuel, Move and Sustain will then be assessed to answer the question of how technology will enable and/or leverage these functions under the redesigned Force XXI division support concept. This assessment will demonstrate that technological initiatives are not

critical to the success or failure of the CSS organizational support concept for the Force XXI division.

This Force XXI support concept is designed to continue the evolutionary development of multi-functional support units started with the development of the FSB and MSB following AOE study. The logistical control capabilities that are functionally the responsibilities of the support operations sections found in the FSB and MSB are expanded into the FSC. Support operations sections provide an important node for the centralized management of tactical logistics to control the materiel and movement management for the maneuver brigade and battalion. These functions are currently conducted through the DISCOM material management center and the DSUs in each of the FSBs, division aviation support battalion (DASB) and MSB using standard army management information system (STAMIS) automation.

Automation is not new to the logistics community; it was the first area of the military to become computerized after World War II.<sup>46</sup> Additional automation and information management technologies have continued to positively impact upon improving logistics support since AOE. The Army is currently using automation in every company with the Unit Level Logistics System (ULLS) to support maintenance and supply functions. Most battalions are using Standard Installation/Division Personnel System (SIDPERS) for personnel management. In all Direct Support Units either supply or maintenance activities are using Standard Army Retail Supply System (SARSS) or Standard Army Maintenance System (SAMS) for supply and maintenance management. The current automated logistics system such as ULLS, SARSS, and SAMS are integrated



to share specific information such as requests, status, and receipts. Future automation initiatives are designed to increase the quantity, accuracy, connectivity, and timeliness of this type logistics information.

Force XXI redesigned division support organization concept is structured to support a new or improved Battlefield Distribution (BD) system. The BD system is a sub-set of the Total Distribution Program (TDP) that covers in-theater distribution from the port of debarkation to the combatant.<sup>47</sup> The TDP and BD system incorporates Automated Identification Technology enablers, such as Radio Frequency Tags and readers to support improved In-Transit Visibility (ITV) with a ultimate goal of Total Asset Visibility (TAV). The overall objectives of the Battlefield Distribution System is to improve the efficiency and effectiveness of support on the battlefield through (a) increased supply velocity, (b) maximizing distribution capabilities, (c) conversion from a batch processed warehouse-based system to a real-time distribution based system, (d) decrease redundant supply stockage in forward units through consolidation and greater reliance on rapid delivery, (e) establishment of movement control and material management nodes at every level under a single distribution manager from the source to the direct support unit, (f) providing TAV-ITV for tactical, operational, and strategic levels of material.<sup>48</sup>

Distribution of supplies and support is not a new innovation to the battlefield. Current battlefield distribution incorporates the maneuver battalion's combat and field trains, the brigade support area, FSB, MSB, and higher echelon support. Maneuver units use elements of the battalion field trains to assemble reconfigured supply packages or

logistics packages (LOGPACs) to distribute support to the supported companies.<sup>49</sup>

Division and Corps support units can provide support or resupply directly to the maneuver battalion by passing one or more echelons in the supply system. This method of distribution is known as Through-Put.<sup>50</sup> Under the new Battlefield Distribution system Through-Put distribution methods from corps will be maximized using the FSC as an effective ship-to-address for the maneuver battalion. Pushing supplies directly from corps to the maneuver battalion reduces the support burden to the division but increases the burden to corps. Corps must now break shipments into smaller loads for delivery to more locations. Otherwise the FSC merely assumes the support responsibilities of the maneuver battalion HHC. The initiative of battlefield distribution appears to be supported by TAV/ITV but not dependent upon it. The important distinction is that information about supply will vastly improve efficient operations and manpower along some sliding scale of TAV implementation and achievement. This improvement will be gauged against a yet unknown manpower requirement level. However, it is evident that the FSC organization will consolidate maintenance functions and repair parts management for the battalion and brigade into the FSB reducing the overall size of the supply pipeline irrespective of technology advancements. Finally, the addition of a distribution manager in the support operations section of the FSC will organizationally and functionally support maneuver battalion requirements given current and future TAV technology.

To accomplish increased efficiency and effectiveness, tactical support organizations will utilize an automated communications system termed the Integrated

Combat Service Support System (ICS<sup>3</sup>). The ICS<sup>3</sup> will integrate all current and future Standard Army Information Management Systems (STAMISs) such as SARSS, SAMS and ULLS to name just a few. This information along with automated appliqué reports from individual weapons systems and collective units will provide the logistics leader at the support operation section “a common, relevant picture of the battlefield”; allowing the logistician to better anticipate, focus and improve support distribution.<sup>51</sup> Current automated support systems in the division are capable of providing and receiving automated input manually via diskettes or through wired and non-wired communications methods. These are capable systems that can operate independently regardless of future systems integration. Therefore efficiencies in the form of reduced personnel within a single service support system remain to be seen. The FSC organization structurally does not appear to depend on this technology. The number of personnel required to perform the support functions of the maneuver battalion will dependent in part on the applicability and utility of ICS<sup>3</sup> and other technologies. Therefore, TAV and BD the ICS<sup>3</sup> does not drive the FSC and DISCOM reorganization effort. However, the assumptions on the application of these technologies with regards to the personnel efficiencies and savings that could be gained will require extensive testing and manpower analysis that is out side the scope of this study.

Digital appliqués are digital methods applied to current functions using computer technology to provide a visual based communications environment requiring minimal human operational effort and maximizing the use and flow of information. This is not a precise definition but one that supports the intent and purpose of appliqué development.

Appliqués are undergoing development through the Joint Venture axis to provide a command and control system below the brigade level. Currently for CSS the appliqué will either interface with or become a module of ULLS and from there will be integrated into ICS<sup>3</sup>.<sup>52</sup> The availability of materials and systems for appliqués along with the digital communications technologies required to support a tactical internet are assumptions used to develop an appliqué division and corps by the year 2000 and 2006 respectively.

Appliqués are currently being developed to digitize command, control, communications and intelligence interface for individual tanks and armored vehicles as well as resupply vehicles. The benefits of digital appliqués are the ability to transmit voice, image and text data accurately and quickly to and from the forward line of troops (FLOT). Optimally, some of the reporting, updating and transmission functions can be automatic with little or no human interaction at the tactical level. For example a report on a tank's, fuel, weapons, personnel, location and equipment status can be transmitted upon digital request, time or some other parameter to automatically update individual data fields by using onboard sensors. Similarly these systems will provide the operator a relevant picture of the battle field though accurate locations of friendly and possible enemy forces as well as terrain. The application of digital devices is limited only by the imagination, invention, and computer and communications technology. CSS data from appliqués is critical to providing anticipatory versus reactionary logistics. Just-in time supply is contingent on understanding and accurately estimating the need early enough to acquire and deliver supplies or fill needs. Therefore, the earlier a need is identified, such as through an appliqué digital transmission the faster the logistics system can respond to

the units needs. The Appliqué systems should support the collection, monitoring, and reporting of Personnel and Logistics Situation and Status Reports (PERSITREP, LOGSTAT, etc.)

Each of the six logistics functions have additional and more specific technologies under development that are intended to leverage each functions support capability.

MAN: Manning the force tasks include personnel readiness management, replacement management, and casualty management. The Force XXI manning functions will be integrated with other digitized systems to support successful combat operations. The following enabling technologies are required to effectively synchronize the capabilities of small Personnel Service Support (PSS) organizations in the division area with the capabilities at higher tactical, operational and strategic levels. The Multi-technology Automated Reader Card (MARC), The Force XXI Manning System (FMS), and personnel modules and functions in the Combat Service Support Computer System (CSSCS), the Army Battle Command System (ABCS), and the appliqué-Force XXI Battle Command at Brigade and Below (FBCB2). Under this concept PSS is controlled and managed by the G-1 at the division level with augmentation from corps. The PSS organizational structure is not discussed in this concept but appears to remain unchanged. The S-1 sections however, should gain improved capabilities with the predictive functions of FMS in operations planning, as well as the automated personnel records systems and manifesting with the availability of the MARC personnel identification system. Personnel Situations Reports (PERSITREP) should be enhanced and more convenient with the use of an appliqué system. Current personnel STAMIS's have

decreased the response and service times and increased services available to soldiers at the battalion, brigade and division level. These systems should only improve with the evolution of computer and software engineering. There currently is no clear evidence or initiative to support elimination of any personnel supporters, therefore, these technology enablers are purely enhancing levers.

ARM: Arming the force relies heavily on the automated capabilities of the appliqué Logistics Situation Reporting System. The FSC through the supply and transport platoon receives ammunition through-put deliveries and/or picks-up ammunition from the brigade ammunition transfer point and provides the class V to the maneuver battalion. The appliqué LOG SITREP system will increase the speed the approval and issue process from the Division Ammunition Office and automatically generate resupply actions to the ATP.<sup>53</sup> However, this system does decrease the amount or requirement to supply and move ammunition. This technology enhances transportation resource utilization, distribution accuracy and timely requirement submission

FIX: Fixing the force. Under the FSC concept the greatest expectation for savings of personnel is in the area of maneuver battalion maintenance. The plan calls for the elimination of a number of redundant maintenance and supply personnel used to provide organizational maintenance, TAMMS, and repair parts management. The FSC now performs all organizational and direct support maintenance to include TAMMS and services. Maneuver battalions PLL are consolidated into the ASL of the base support company in the FSB. The FSC maintains limited class IX in the form of a small quantity

of combat spares, major assemblies and shop/bench stocks items. Therefore the TAMMS clerk is transferred from each HHC to the FSC , and the PLL clerk is eliminated using supply support directly from the base support company. The consolidation of organizational and direct support maintenance at one level verses two should produce some material manpower saving. The FSC organizational change should eliminate duplicate diagnostics and repair preparation procedures. In war the combat repair team (CRT) will provide battle damage assessment and repair (BDAR), diagnostics and line replacement unit (LRU) replacement using CD ROM repair procedures and additional diagnostic equipment.<sup>54</sup> In the Army After Next (AAN: beyond the year 2010) new equipment acquisitions will be designed to be fail safe with embedded self-diagnostic capabilities and able to transmit its fuel and ammunition requirements on the fly.<sup>55</sup> Maintenance manpower requirement is a difficult commodity to forecast in war. Peacetime planning for combat service support such as supply and manpower seldom goes according to plan in combat zones<sup>56</sup>. Technology enablers such as diagnostics equipment will no doubt save time in the assessment phase of maintenance and increase the probability of a first time fix. This does not however logically reduce greatly the total maintenance requirement for a Force XXI heavy maneuver battalion with 58 M1 tanks. Through consolidated PLL and TAMMS management along with increased diagnostics and one level division maintenance some personnel should be saved. Still the overall maintenance requirement for a unit is dependent upon its vehicle/weapons density and its operational tempo. With no major changes in the engineering and/or reduced quantity of the US Army's major weapons systems in a maneuver battalion it is difficult to

rationalize large maintenance personnel savings. Scheduled services alone keep organizational motor pools busy maintaining readiness.

FUEL: Fueling the force. The FSC utilizing assets from the S&T platoon will provide the tactical refuel requirements of the maneuver battalion. The battalion S-4 and the FSC support operations section will coordinate with the support operations section of the FSB for bulk refuel and additional fuel requirements. The appliqué system will communicate the location of vehicles and requirements for fuel from the company and platoon level to the S-4 and FSC support operations section. This technology when available will digitally transmit requirements to the FSB, and Division Materiel Management Center (DMMC) for consolidation with other divisional requirements for corps and theater level support.<sup>57</sup> This appliqué system is the only technology enabler leveraged to fuel the force. The appliqué once again enhances support by providing more accurate requirements, unit locations using GPS, and assists in the efficient utilization of time. Additional digital appliqué information will allow for rapid formulation of relevant consumption factors. However, saving through lower numbers of personnel and materiel can only be envisioned for the staff planning, requesting and management functions. Technology enablers do not reduce the consumption requirements of large fuel consuming weapons systems or their density with-in the maneuver battalion. The Force XXI CSS concept is not any more dependent on the appliqué technology than the current organization. In fact the FSC, and redesigned FSB and DISCOM appear to be in a good position to adapt and incorporate the appliqué



technology when fielded. The FSC refuel capabilities must be aligned with the equipment density and operational use of the supported unit.

MOVE: Transportation for and of the force. Force XXI relies heavily on an improved supply system that leverages transportation to increase the velocity and accuracy of logistics. The result is the elimination of massed stockages of supplies at multiple locations in the supply pipeline.<sup>58</sup> As stated earlier Battlefield Distribution improves supply responsiveness and decrease costs through the increased velocity and accuracy of supply distribution. This approach is called “Velocity Management” and affects supply management, component repair and transportation functions. This management method attempts to improve order ship time (OST), repair cycle time, and leverages fast transportation to improve velocity. The BD system uses a “hub and spokes” supply system that incorporates initiatives to decrease processing, repair, and transportation times in order to decrease order ship times and reduce overall costs to fund the pipeline. Transportation has become less expensive compared to the costs of stocking components for the high tech weaponry of today and the Force XXI Army. Due to these changes in stockage policy caused by economics, an increased reliance on transportation is required. The enabling technology of new container delivery and more reliable vehicles are important in order to effectively transload and move supplies on the battlefield. The enabling technologies of TAV/ITV, appliqués and multiple other automated systems such as CSSCS will improve the accuracy of supply delivery and utilization of transportation assets.<sup>59</sup> Additionally the Force XXI division will be rapidly

deployable and 100% mobile at the brigade and maneuver battalion level. This function is enhanced with transportation assets and a consolidated logistics manger in the FSC.

SUSTAIN: Sustaining soldiers. The function of providing general supply support, water, and services. General supply includes supply classes I, II, IIIp, IV, VI, VII, IX, and services include food service, mortuary affairs, airdrop, and laundry, bath and clothing repair. Food service and mortuary affairs are still the only two field services organic to the division. The water production capabilities and supply point distribution still reside in the Brigade Support Area (BSA). The capabilities of the Reverse Osmosis Water Purification Unit will be expanded and augmented by Corps as required. The only other initiative to streamline support is to provide individual soldiers water purification capabilities and design systems such as food production, sanitation, and laundry that are less dependent on water.<sup>60</sup> Supply and distribution are improved enhancements of this organizational structure making the FSC allows for an effective "ship to address" for distribution on the modern battlefield.<sup>61</sup> It fully supports the current automated supply systems and the future initiatives planned for an improved Battlefield Distribution system using Velocity Management techniques.

These technologies are expected to enable logistic personnel to achieve substantially enhanced personnel productivity, decrease the size of supply inventories, increase the velocity of supply and ultimately reduce the number of logistics personnel required to support a battalion, brigade, and division. However, most of these enabling technology systems are not yet fielded and their application and efficiencies are unknown at this time. The major personnel savings expected in the maintenance

functions through consolidation and increased diagnostics is not fully supported by current Force XXI technology enhancements. It is not logical to expect to save over 20 maintenance personnel in support of each maneuver battalion without major re-engineering of the M1 Abrams tank and BFV or a reduction in the number of these systems assigned to each maneuver battalion. Only through the redesign of weapon systems that are truly maintenance free is the need for a large numbers of mechanics reduced.

## Lesson Learned

Organizations are an integral component of any army's ability to command and control its activity on the chaotic battlefield. Militaries continue to develop superior organization that best support their applied tactics given the technology of the day. Often these organizations were designed to provide a greater degree of command and control to affect a greater application of force and improve survivability on the battlefield. This organizational quest is still evident today. Through historical and practical study the US Army has developed, changed and reorganized its forces many times to prepare for the next or current war. Through these changes a number of lessons have been learned. However, often the same lessons are learned each time the US Army reorganizes. The last major reorganization the U.S. Army made was to support Air-Land-Battle doctrine with the development of Division 86. The Division 86 structure was reevaluated under the Army Of Excellence to meet force structure constraints and accommodate the development and insertion of Light Infantry Divisions into the force structure. The Division 86 and AOE reorganization centered on the structure of the division as does the Force XXI concept and shares several of the same redesign objectives. Those shared objectives include; meeting the nation's defense needs with reduced resources, increasing the tooth to tail ratio, improving deployability, and obtaining a higher leader to led ratio.<sup>62</sup> The Combat Service Support organizational structures were dramatically changed during AOE in order to streamline functions, reduce non-combatant force structure, and support greater combat power end strength. That AOE process resulted in the development of the FSB and MSB which serves as the baseline to evolve the current

concept for CSS operations in support of Force XXI Division Redesign. However, following AOE implementation the field continued to identify shortfalls and complain of an empty force. Thus some positive and negative lessons were learned that should be exploited and/or avoided with the testing and possible implementation of this new concept.

The US Army is reorganizing to meet the post cold war and information age environment of the 21st century with the following vision in mind "America's army, trained and ready, a strategic force, serving the nation at home and abroad, capable of decisive victory... into the 21st Century".<sup>63</sup> The US Army will attempt to synchronize the development of doctrine, leader development, organizations, and materiel changes focused on soldiers (DTLOMS)<sup>64</sup> to affect the vision of Force XXI. However, "How forces are structured determines, to a great extent, how effectively the unit will operate and what can be accomplished on the battlefield."<sup>65</sup> The ability of this future force to meet the broad Force XXI vision will hinge on the tactical, operational and strategic logistics capabilities of the force and the nation.

Historically, the number of personnel and functions required to support warfare has continued to increase to the point where division level forces became so large they were too large to effectively move on the battlefield; as was found under the Division 86 organizational structure.<sup>66</sup> For some time, the force structure dilemma has been the trade off between assigning support capabilities to smaller self-sufficient units and the consolidation of support capabilities in larger units for more efficient utilization. Additionally, there has been a general trend to increased numbers of support personnel in

a direct support role. In 1942 General Leslie J. McNair called for the restriction of the number of non-combat troops and the pooling of all nonessential combat assets at higher headquarters. This led to a doctrinal debate over whether or not units should be "task-forced" or "type-forced." From this discussion divisions were "type-forced" along functional lines, while higher echelons became "task-forced." Lower echelons, while initially "type-forced," slowly became "task-forced" as war developed.<sup>67</sup> This task force development was a function of creating more self-sufficient units on the disbursed battlefield. The Pentomic division design was an attempt to create smaller self-sufficient combat units, larger than a battalion, but smaller than the regiment that would be a more flexible combat unit as well as a less lucrative target on the nuclear battlefield.<sup>68</sup> Though the Pentomic division made theoretical sense for a nuclear environment it was found to be too small to have sustaining power in either a nuclear or non-nuclear environment.<sup>69</sup> Additionally there was a shift in defensive doctrine from massive retaliation to flexible response that caused a fundamental reorganization in the division. The new concept was the Reorganization Objective Army Divisions (ROAD). ROAD evolved from other reorganizational concepts such as the Modern Mobile Army (MOMAR) and the belief that the future nature of war would be more limited. The MOMAR division kept the Pentomic structure but was tailored to fit a heavy or medium mission. The heavy MOMAR division was the traditional heavy armor division and the medium MOMAR division was a mechanized infantry division. Most importantly the MOMAR pointed the way to organization for limited versus general war.<sup>70</sup> ROAD centered on a division of three brigades with two to five maneuver battalions each. This design allowed the

flexibility to employ a brigade in an independent role. This development was an evolutionary process reflecting the trend toward self-sufficient maneuver units and the required dispersion of units.<sup>71</sup> This evolutionary reorganization process continued to Division 86.

Division 86 was the approved organizational plan fielded with the October 1983, J-series Table Organization and Equipment (TOE). However, just prior to implementation the army leadership realized this force structure was un-supportable at current personnel authorization levels. Additionally, the large heavy division though well suited for new Air-Land-Battle doctrine that focused mid and high intensity forward deployed European conflict it was ill suited for limited low intensity and force projection environments. Therefore, the Chief of Staff of the Army (CSA) directed the TRADOC Commander to conduct a feasibility study for restructuring the army. The TRADOC Commander directed the Combined Arms Center Commander, Fort Leavenworth to form an Army of Excellence (AOE) study group to determine approaches to reduce the manpower and resources within the army structure while maintaining or enhancing current combat capability to perform combat missions according to Air-Land-Battle doctrine.<sup>72</sup> Additionally the AOE study group was to develop a new design for a footmobile light infantry division.<sup>73</sup> The AOE study was guided by specific guidance and a methodology that led it to a greatly reduced manning level for a heavy division and the development of a light infantry division design.

The CSA Guidance for the heavy division was "to reduce the total end strength of the division while maintaining the combat capability." Specific guidance included:

- (1) Retain ten maneuver battalions.

- (2) Consider the elimination or transfer of the Chaparral, 8-inch howitzers, MLRS, and aviation assets.
- (3) Retain the capability to adhere to Air-Land-Battle doctrine.
- (4) No specific end strength was provided as a constraint.<sup>74</sup>

As for the development of the light infantry division the CSA provided the following guidance:

- (1) The division will contain about 10,000 soldiers.
- (2) It will have nine maneuver battalions.
- (3) Deployable with 400-500 aircraft sorties.
- (4) One half of the division will be infantry.

In addition to the CSA's guidance the TRADOC Commander provided the following guidance to the heavy division portion of the study group:

- (1) Determine where personnel savings could be effected by reducing the inherent robustness and redundancy of the designs while maintaining the division's capability to conduct AirLand Battle.
- (2) Determine the feasibility of moving functions and weapons systems such as ADA, MI, 8 inch artillery, MLRS, target acquisition and aviation to corps.
- (3) Increase the tooth-to-tail ratio of the division.
- (4) Determine where concepts developed for the light infantry division are applicable to the heavy division design.
- (5) Maintain ten maneuver battalions in the division design.<sup>75</sup>

Guidance for the Light infantry design group was as follows:

- (1) There are no "sacred cows." Every avenue toward minimizing personnel requirements and deployability profile would be explored.
- (2) Workload factors and allocation criteria would be reduced to the minimum essential for operations. Accepted Manpower Authorization Requirements Criteria (MARC) levels would not be binding if further savings could be made while maintaining acceptable combat power.
- (3) Selection of materiel for the Light Infantry Division would be based upon availability of the systems. Items with an initial operational capability (IOC) date of 1986 or earlier would be used.
- (4) The effort should be innovative in its approach.
- (5) Examine desirability and suitability of standardizing light forces.



(6) Design lean and austere organizations that meet conceptual requirements in the most efficient manner possible providing only those assets and functions that would always be needed. All other occasionally required functions will be passed to corps.

(7) Design the division to accept augmentation from corps as required by METT-T.<sup>76</sup>

With all of this guidance in mind the AOE study group designed a heavy division organization reduced by 2,931 personnel. Air Defense assets and personnel were moved to Corps, along with the 8-inch howitzers. Division aviation capabilities and personnel were reduced, the functional battalions in the DISCOM were consolidated into a Main Support Battalion reducing 360 personnel, and headquarters units at company, battalion, brigade and division were reduced eliminating a number of administrative, maintenance and supply-clerks, mechanics, and cooks. The AOE study as directed by the leadership targeted many logistics (non-combatant) personnel organic to each maneuver and functional battalion in addition to the personnel assigned to the DISCOM for elimination from the force structure all together to provide force structure for the light infantry divisions. While not all reductions were support personnel, the vast majority were.

The AOE divisional organizational structure developed a much leaner support structure. Many would argue that multifunctional FSBs and MSBs are a vast improvement in efficiency and effectiveness over the FAST concept. With this support structure the army has proven itself effective during recent operations such as Just Cause, Desert Shield and other operations with even more limited scope, duration and objectives. However, maneuver, combat support, and combat service support units have had to increase the duties and responsibilities of their soldiers through the cross training

of non-MOS specific support skills such as supply, and administration. Some of these increased duties dovetailed easily with wartime duties such as the combining of driving and radio duties. With regards to company administration, supply and maintenance this is often not the case. Though not spoken about or reported, companies often use shadow clerks in their headquarters, supply room and motor pools to support the daily unit operations. Soldiers force structured for other purposes are diverted from their preparations and training for combat to meet the very real logistical needs of many units.

To support these changes maintenance procedures were streamlined at organizational and direct support levels to accommodate a reduced force structure. Maintenance within the division was geared more to component replacement verses repair with a greater reliance on the general support level maintenance.. Additionally, motor pool operations were consolidated at battalion level to reduce administrative redundancy and increase operational efficiencies in garrison. The company and battalion organizational level maintenance centered on services, limited diagnostics, component replacement and evacuation to direct support maintenance facilities at the FSB. The FSB streamlined its repair timelines and criteria to decrease its workload and evacuate repair to corps or installation activities. Overall maintenance was designed more to component replacement at all levels and less component repair. This focus has proven successful but expensive with regards to supply. However, services alone and line replaceable units requires skill, time and manpower to accomplish. The current Force XXI support structure continues this evolutionary trend by eliminating a large number of maintenance support personnel through diagnostics and elimination of duplicative efforts.

All company level personnel clerks were consolidated into battalion personnel action centers (PACs). The administrative personnel assigned to the consolidated battalion PACs were then reduced due to efficiencies realized from the use of high technology personnel system (HTPS). This relocation of personnel clerks eliminated and/or ignored the requirements for company level administration. All company level reports and correspondence were to be eliminated or reduced due to the consolidated PAC and computer technology. Computer technology has to date only increased the capability and speed to which information can be provided and within this computer information environment exists an increased demand for more detailed and accurate information.

The army field feeding program reduced the number of cooks and equipment required to support the division by the development and fielding the T-Ration. Under the new field feeding concept each soldier would receive one hot T-Ration meal a day. All organic A or B ration capability in the division would be eliminated.<sup>77</sup> The army field feeding program provides the minimum number of food service personnel to facilitate the operation of limited food service equipment mainly designed to heat water and ration containers required to serve a Tray type operational ration. In Garrison the consolidated dining facility is contracted with local food service contractors and negates the need for active duty food service personnel. However, on long deployments the Army Field Feeding Program lacked the flexibility to provide improved subsistence support effectively.

Some AOE changes produced some very positive results. The division was able to more efficiently utilize the capabilities of the DISCOMs functional support battalions (Maintenance, Supply and Transportation, Medical) with the FSB and MSB organizational structure and the development of habitual support relationships with maneuver brigades. The reductions of support personnel within all units did provide needed force structure for the Light Infantry Division while decreasing some of the units self-sufficiency. Minimal risk of support to maneuver units was mitigated through a greater reliance on direct support units such as the FSB. Additionally, the consolidation motor pools demonstrate the ability to consolidate TAMMS and PLL functions for like units such as line companies in a maneuver battalion. The maintenance procedures adopted with the development and fielding of newer weapons systems such as the M1 Abrams tank, and M2 Bradley fighting vehicle were proven successful. These procedures relied on unit level component diagnostics and replacement, to save repair time at the unit by accomplishing component repair at depot level activities. However, manpower requirements are still heavily tied to the equipment density, service requirements, and operational tempo of the equipment being maintained. Additionally, these procedures are heavily reliant on the supply and financial management systems.

The Army field feeding program was successful given the availability of the T-Ration or similar operational ration. However, the concept is vulnerable with the interrupted supply of unitized and prepared operational type rations. Also on long deployments the American soldier is much more demanding in the area of food service and has grown accustomed to higher level of food quality while deployed. Operational

rations are extremely useful for limited duration operations such as NTC rotations, and during possible hostile activities. However, in low intensity environments, and in operations other than war i.e. humanitarian assistance, peace keeping or when ever METT-T will allow, soldiers want a hot A ration meal. The AOE food service concept removed many trained food service personnel and specialized equipment from the force structure which eliminated the flexibility to provide improve food service on deployments.

The AOE reorganization has created some additional negative side effects. Given the elimination of MARC and the fixation on the tooth at the expense of the tail the US Army has accepted risk in the supportability of the division without substantial augmentation and/or direct support from corps or theater assets.<sup>78</sup> The use of company shadow clerks in motor pools, supply rooms and headquarters are still in use today. This practice can lend to a false sense of security when fighting begins and critical support functions are left unattended. This approach may work for a short time but as force projection army support may be the very functions that is needed most. Thus we may be guilty of building a White Elephant incapable of performing its advertised functions. The AOE method of reorganization may be a prime example of developing a “way” to affect an “end” without the “means” to support it. In the Information Age of the 21st century and the non-linear battlefield the army will require the flexibility it says it needs but does not want to accept or pay for. A method that breaks the mental model most of us have for a fighting ground force such as Force XXI and a systems approach to the

measurement of combat effectiveness is a approach that will foster the development of innovative approaches to achieve the goals of the senior leadership.

The CSS operations in support of the Force XXI Division Redesign are limited by some of the same guidance used for the AOE study. Obviously, much of the guidance is common sense. Save where you can, economize on the use of all resources, improve and increase the effectiveness and efficiency of what is available, leverage technology, and stay with-in or reduce manpower requirements. The primary guidance for development of CSS organization and procedures described in CSS operations in support of the Force XXI Division Redesign and for the AAN is found in the Force XXI Campaign Plan, guidance from the CSA, and in TRADOC PAM 525-200-6. Support at the tactical level must be multi-functional and modularity designed to support task-organized combat, combat support and combat service support capabilities. The support units should leverage personnel by increasing the leader to led ratio to increase the application competent skills. Units must increase effectiveness without an increase in personnel through elimination of redundant and unneeded functions, and with technology. Information technology leveraging is emphasized but does not negate mechanical advancements such as container delivery mechanisms, and material handling equipment and vehicles. Information collection, processing and dissemination are primary tenants that support the Force XXI concept. CSS units are to obtain a common relevant picture of the battlefield with integrated support systems to anticipate verse react to support requirements.<sup>79</sup> Success of this objective for Force XXI and in the future is contingent upon assured communications/automation, full exploitation of all logistical capabilities

within a given AOR based on METT-T, and maximum use of available strategic air and sea assets.<sup>80</sup>

Several lessons learned for AOE and Division 86 are applicable to CSS reorganization for Force XXI. First the evolution and use of the FSB and MSB design appear to be validated and applicable for future divisional support requirements. The structure of the Force XXI division has not changed greatly<sup>81</sup> and therefore the current design features of the FSB (regardless of the FSC concept) and MSB meet the multi-functionality and modularity called for in the Force XXI plan. Second that consolidation of logistics functions and the increased reliance of support from higher echelons have produced support personnel savings within all battalions at the division level. However, with the proposed Force XXI division redesign and procedures outlined in the CSS concept it is difficult to see where information technology and organization will reduce the need for substantial numbers of support personnel. Supply velocity and perfect information does not mitigate the requirement to repair equipment when it breaks or needs service. Current manpower allocations even though ignored during the AOE reorganization appear to meet the unchanged density of weapons systems, vehicles and personnel in the maneuver battalion and brigade of Force XXI and today. Without redesigned more reliable weapons systems that eliminate to some degree the support they require a large reduction in personnel appears to illogical. Third providing improved CSS with fewer personnel using enabling technology accepts a certain level of risk with the reliability, applicability, and feasibility of those technologies; such as the T-Ration on long deployments. Additionally, many support functions and capabilities lacking in the

division are simply absorbed by a higher support echelon with no additional capability creating an even greater personnel leveraged risk. Echelons above corps support capabilities are in great demand and often have a much greater operational tempo than support units of a division. These critical support functions can not be overlooked as the army concentrates on the division. If logistics is ever going to be seamless we must break the mental models of old echeloned support systems and tooth to tail ratios, and look at logistics as a capability and function of combat power.



## Conclusions

The *CSS Operations in Support of Force XXI Division Redesign* is an organizational support bridge to the future. The reorganized division support structure provides a more seamless and efficient organization that meets the logistics characteristics envisioned in today's doctrine and supports initiatives to meet the goals for the future force. The proposed CSS support structure also appears to provide a more efficient structure from which to apply new and enhanced technologies. However, technology is not a panacea for personnel efficiencies. The effective application of technology to produce personnel efficiencies must be thoroughly tested and validated prior to implementation. The lessons learned from prior reorganizations should assist the development of the Force XXI. The Force XXI initiative, not unlike the AOE study, is attempting to meet the changing nature of war given force structure limitations and the obvious objective of creating the greatest capability for the least cost. During AOE in order to meet specific manpower objectives, many manpower requirements were ignored such as MARC; and a great reliance was placed on technology to leverage personnel requirements. The operational T-Rations and the Army Field Feeding Program is an example of technology leveraging that proved an incomplete success at best. Caution must be exercised prior to the elimination or realignment of personnel positions. The U.S. Army needs to concentrate more on the systems approach to combat power and include all combat support and combat service support as integral parts of the whole following the guidance of TRADOC PAM 525-5. Perhaps a vision of CSS and CS as a "skeleton"

to which “muscle” of combat arms is attached is superior to a “tooth” and “tail” approach that leads us to believe we can fight without a tail.

An analysis of current and possible future doctrine, today’s technology enablers, and lessons learned from the last major reorganization of the army during the AOE study offers several conclusions. First, that the reorganized force structure of the DISCOM with the development of the FSC appears to make good doctrinal and practical sense. Second, that information and improved material technology supports the reorganization but it is not the foundation of the concept. Technology will enhance support capabilities and should reduce manpower requirements once those technologies are fielded. Finally, manpower requirements are often overlooked or omitted during the organizational development process to meet a specific endstate such as a increased “tooth-to-tail” ratio. However, manpower requirements must be validated and then implemented as a part of the system. The number of personnel assigned to provide support to a Force XXI division requires objective testing and validation under the myriad of situations to ensure manpower needs are met. Consolidation of functions does not eliminate the hard work of an individual providing effective combat service support.

The reorganized DISCOM provides the FSB with a greater capability to meet the logistics requirements of the maneuver units, and thus really emphasizes forward support. The development of a FSC with a support operations section improves the CSS systems ability to anticipate, integrate, respond and ensure continuity to maneuver units. This synergy is achieved through the logistics specialization and capabilities of FSB, and its relationship between the maneuver unit and the FSB. The final personnel structure of the

DISCOM, relationship of the FSB to the maneuver battalion and administrative procedures such as funding will require more attention as the redesign process moves forward. As a concept, however, the CSS reorganization is a bold initiative. It indicates a real effort by the logistics community to meet the guidance of the military leadership and produce a well conceived of and conceptually viable innovative solution to provide improved and more efficient support to the future division.

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<sup>1</sup> "Force XXI.... America's Army of the 21st Century" Office of the Chief of Staff, Army, Director, Louisiana maneuvers, Fort Monroe, Virginia, 11.

<sup>2</sup> Ibid., 9.

<sup>3</sup> Ibid., 25-29.

<sup>4</sup> "Revolution in Military Logistics (RML) (Draft 1 Release), HQDA, ODCSLOG, 1.

<sup>5</sup> "CSS Operations In Support Of Force XXI Division Redesign" Final Draft, Combined Arms Support Command, Fort Lee, VA 19 June 1996, 1-2.

<sup>6</sup> "Force XXI.... America's Army of the 21st Century" Office of the Chief of Staff, Army, Director, Louisiana maneuvers, Fort Monroe, Virginia, 10.

<sup>7</sup> "Critics: Design 'too conservative' ", Army Times, April 22, 1996, pp 18-19.

<sup>8</sup> "CSS Operations In Support Of Force XXI Division Redesign" Final Draft, Combined Arms Support Command, Fort Lee, VA 19 June 1996, 1-1.

<sup>9</sup> Ibid., 2-4.

<sup>10</sup> Ibid., 1-1.

<sup>11</sup> Ibid., 2-10.

<sup>12</sup> Ibid., 1-3.

<sup>13</sup> Ibid., 2-12.

<sup>14</sup> Ibid., 2-13.

<sup>15</sup> Ibid., 2-3.

<sup>16</sup> Ibid., 2-6.

<sup>17</sup> Ibid., 2-4.

<sup>18</sup> Ibid., 2-5.

<sup>19</sup> Ibid., 2-7.

<sup>20</sup> Ibid., 2-8.

<sup>21</sup> "Division and Force XXI Sustainment" Force XXI Concept Brief, Combined Arms Support Command, Fort Lee, VA

<sup>22</sup> Leavenworth Paper No 16, pp 7.

<sup>23</sup> Ibid., 3.

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- <sup>24</sup> TRADOC Pamphlet 525-200-6, Combat Service Support, 9
- <sup>25</sup> "CSS Operations In Support Of Force XXI Division Redesign" Final Draft, Combined Arms Support Command, Fort Lee, VA 19 June 1996, 1-1.
- <sup>26</sup> TRADOC Pamphlet 525-200-6, Combat Service Support, 5.
- <sup>27</sup> "Future Vision, A Vision for the Future" Military Review, May-June 1995, 7.
- <sup>28</sup> FM 63-20, 8-7 to 8-10.
- <sup>29</sup> Ibid., 2-5 & 2-6.
- <sup>30</sup> Drucker, Peter F., The Frontiers of Management, Harper & Row, New York, 203-207.
- <sup>31</sup> FM 100-5, 12-3.
- <sup>32</sup> Ibid., 12-4.
- <sup>33</sup> Ibid., 12-4.
- <sup>34</sup> Ibid., 12-4.
- <sup>35</sup> Ibid., 12-5.
- <sup>36</sup> Heiser, Joseph M. Jr., "A Soldier Supporting Soldiers", U.S. Government Printing Office, Washington, D.C., 249.
- <sup>37</sup> TRADOC Pamphlet 525-200-6, Combat Service Support, Forward.
- <sup>38</sup> Ibid., 3.
- <sup>39</sup> Ibid., 5.
- <sup>40</sup> Heiser., 248-9.
- <sup>41</sup> Magruder, Carter B., "Recurring Logistics Problems As I Have Observed Them", U.S. Government Printing Office, Washington, D.C., 121.
- <sup>42</sup> Van Creveld, Martin, "Supplying War. Logistics from Wallenstein to Patton", Cambridge University Press, New York, 202-230.
- <sup>43</sup> "Leveraging Logistics Technology Toward Force XXI" Johnnie E. Wilson and Robert Capote, Army Logistician, July-August 1995, 14.
- <sup>44</sup> Ibid., 14 & 17.
- <sup>45</sup> "Does Technology Drive History? The Dilemma of Technological Determinism" edited by Merritt Roe Smith and Loe Marx, MIT Press, Cambridge, Massachusetts, 82.
- <sup>46</sup> DeLanda, Manuel, War in the Age of Intelligent Machines, MIT Press, Cambridge, Massachusetts, 1994, 107.

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- <sup>47</sup> "Battlefield Distribution for Force XXI, Daniel C. Parker and Jim Caldwell, *Army Logistician*, July-August 1995, 36.
- <sup>48</sup> *Ibid.*, 37.
- <sup>49</sup> FM 100-10, "Combat Service Support", October 1995, 3-3.
- <sup>50</sup> FM 63-2, "Division Support Command, Armored, Infantry, and Mechanized Infantry Divisions", 20 May 1991, 9-3.
- <sup>51</sup> "Integrated Combat Service Support System (ICS<sup>3</sup>) Briefing, CASCOM Home Page 31 October 1996.
- <sup>52</sup> "Applique" CASCOM Automation Home Page, 11 November 1996.
- <sup>53</sup> "CSS Operations In Support Of Force XXI Division Redesign" Final Draft, Combined Arms Support Command, Fort Lee, VA 19 June 1996, 2-12, 3-2.
- <sup>54</sup> "CSS Operations In Support Of Force XXI Division Redesign" Final Draft, Combined Arms Support Command, Fort Lee, VA 19 June 1996, 1-1, 3-7.
- <sup>55</sup> "Revolution in Military Logistics (RML)" Draft 1 Release, HQDA, ODCSLOG; Army Material Command; Combined Arms Support Command; Logistics Integration Agency, 13 Sept 1996, 12 & 30.
- <sup>56</sup> Heiser, 249.
- <sup>57</sup> "CSS Operations In Support Of Force XXI Division Redesign" Final Draft, Combined Arms Support Command, Fort Lee, VA 19 June 1996, 2-12, 3-5.
- <sup>58</sup> Akin, George C., "Battlefield Distribution," *Army Logistician*, January-February 1996, 6-7.
- <sup>59</sup> "CSS Operations In Support Of Force XXI Division Redesign" Final Draft, Combined Arms Support Command, Fort Lee, VA 19 June 1996, 3-13.
- <sup>60</sup> "Revolution in Military Logistics (RML)" Draft 1 Release, HQDA, ODCSLOG; Army Material Command; Combined Arms Support Command; Logistics Integration Agency, 13 Sept 1996, 13 & 32.
- <sup>61</sup> "CSS Operations In Support Of Force XXI Division Redesign" Final Draft, Combined Arms Support Command, Fort Lee, VA 19 June 1996, 1-3.
- <sup>62</sup> TRADOC Pamphlet 525-200-6, 3-5 & TRADOC Pamphlet 525-5, 1-38.
- <sup>63</sup> "Force XXI...America's Army of the 21st Century, Office of the Chief of Staff, Army, Director Louisiana Maneuvers, Fort Monroe, Virginia, 3.
- <sup>64</sup> TRADOC Pamphlet 525-200-6, 1.
- <sup>65</sup> "A History of US Army Force Structuring", John C. Brinley, *Military Review*, February 1977, 67.
- <sup>66</sup> "The Army of Excellence-Final Report", CACDA, Fort Leavenworth, KS, Volume III, 1-1.
- <sup>67</sup> Brinley, John C., "A History of US Army Force Structuring," *Military Review*, February 1977, 67.

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<sup>68</sup> Ibid., 78.

<sup>69</sup> Bacevich, A.J., "The Pentomic Era. The U.S. Army Between Korea and Vietnam", National Defense University Press, Washington, D.C., 134-5.

<sup>70</sup> Ibid., 79.

<sup>71</sup> Ibid., 81.

<sup>72</sup> "The Army of Excellence-Final Report", CACDA, Fort Leavenworth, KS, Volume III, 1.

<sup>73</sup> "The Army of Excellence-Final Report", CACDA, Fort Leavenworth, KS, Volume II, 1.

<sup>74</sup> "The Army of Excellence-Final Report", CACDA, Fort Leavenworth, KS, Volume III, 1.

<sup>75</sup> Ibid., 1-4.

<sup>76</sup> "The Army of Excellence-Final Report", CACDA, Fort Leavenworth, KS, Volume II, 1-4 & 1-5.

<sup>77</sup> Ibid., 8-13.

<sup>78</sup> Ibid., 1-4 & 8-1.

<sup>79</sup> "CSS Operations In Support Of Force XXI Division Redesign" pp 1-2.

<sup>80</sup> TRADOC Pamphlet 525-200-6, 3.

<sup>81</sup> "Critics: Design 'too conservative'", Army Times, April 22, 1996, 18-19.

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